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(71) Applicant: Al'tshuler Grigorij Borisovich Erofeev Andrej Viktorovich

(72) Inventor: Al'tshuler Grigorij Borisovich, Erofeev Andrej Viktorovich,

(73) Proprietor: Al'tshuler Grigorij Borisovich Erofeev Andrej Viktorovich

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(54) METHOD OF TREATMENT OF TOOTH HARD TISSUES BY LASER  
RADIATION AND DEVICE FOR ITS REALIZATION

(57) Abstract:

FIELD: medical equipment, applicable in stomatology at treatment of caries and dental prosthetics. SUBSTANCE: the method consists in action of laser pulse on the tooth tissue, pulse intensity of light radiation of tissue treatment products is detected, and the type of tissue to be treated is determined according to the pulse peak amplitude. The device uses a pulsed laser and means for delivery and focusing of laser radiation arranged in succession in the optical axis, photodetector whose, input is optically integrated with the focusing system focal plane, and an electric pulse amplitude meter, whose input is electrically coupled to the photodetector output, and the output is electrically coupled to the display unit input; the photodetector is installed in such a manner that the direction of its maximum sensitivity makes up angle  $\alpha$  with the direction of the optical axis at the output of the focusing system: this angle satisfies condition  $\alpha > \arctg(D/2f)$ , where  $D$  - clear aperture of the focusing system output window, and  $f$  - its focal length. EFFECT: reduced danger of laser injury to patient. 6 cl, 5 dwg6

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(51) Int. Cl: A6105/00 A61N5/06

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1. ИаТеНТ CWA N 4521194, Кн. А 61 G 5/00, 1987. 2. АБТОРсхое  
CBHjeTCnbCTBO СССР N 1593669, Кн. А 61 C 5/00, 1990. 3. WO, на реу r,  
89/08432, xn. А 61 C 5/00, 1989. WO, наТеНТ, 90/01907, Кн. А 61 C  
5/00. 1990.

(71) Applicant: АнbTm3mep rpHropHff BopvicoHnuEpo(peeB AHRpef BHKTOpOBH<sup>1</sup>т

(72) Inventor: АнbTHrynep rpHropxfl Bopicosme, EporpeeB AHJlпefи BHx'TOpoBHL,

(73) Proprietor: A m'rmynep PpHropHfi BopuconnLrEpo4eeB AHAпefl BmcropoBHу

(54) **СПОСОБ ОБРАБОТКИ ТБЕРПЬИХ .ТКАНЕЛИ ЗУВА ЛАЗЕРНЫМ**  
**УЗЛЮ<sup>1</sup>ИЕНЫМ** 14 УСТРОИСТВО J(JISI ETO OCYи1F.CTBJIEHLI51

(57) Abstract:

У13о6ре reHHe OTHOCHTCA K Mc,E(HHHHCKOf TeXHHKe H MoJKeT 6bITb ЛИСНОnb3OBaHO B  
CTOMaTOJIOPHH npH ne<sup>1</sup>leHHH Kapyeca H npOTe3HpOBaHHH 3y6OB. OCHOBNbIM Hej[OCTaTKOM  
H3BeCTHbIX cнoco6OB o6pa6OTKH TБepHbIX TKaHcлi 3y6a на3epHLIM H3Jly<sup>1</sup>leHHeM H  
ycTpoficTB, пeanm3yIou Mx 3TH Cn0006bI, HBJIAETCA BbICOKaB onacнocTb HaHeCeHHa  
на3epxo2 TpaBMbI наu,HeHTy. 3агаuefl, Ha пelneHHe KOTOpOI HanpaBneHO oasiBjineMoe  
H3o6pCTeHHe, HBUAETCA CHYKеHHC onaCHOCTH HaHeCeHHa наHHCHTy на3epaofl TpaBMbI 3a  
c<sup>1</sup>TeT o6eчne<sup>8</sup>leHHH B03MOIKHOCTH onpegeneHHH THHa o6pa6ammaeMo i TKaHH. YKa3aHHa5  
3aJZaua ,r ocTнаeTcH TeM, иTO B cнoco6e o6pa6OTKH TБepj[blx TKaHefl 3y6a на3epHbIM  
H3ny<sup>1</sup>leHHeM, BKInouaIou eM Bo3j;efic'pBHe Ha TKaHH 3y6a на3epHopo HMmpn,ca,  
perHCTpHpyIOT HHTeHCHBOCTb HMnynbCa CBeTOBOPO H3ny<sup>1</sup>leHHH npOHыKTOB O6pa6OTKH  
TKaHH, HO ИHKOBOMy 3Ha<sup>1</sup>leHHIO KOTOpOPO onpej;enmoT THn o6pa6aTbIBaeMOfi TKaHH.  
YKa3aHHaI 3a);aLia TaKjKe jToCTHраeTcH TeM, лITO yCTpOиCTBO ;vIM o6pa6OTKH TБepJIBIX  
TKaHefl 3y6a на3epHbIM H3ny<sup>1</sup>leHHeM, COCTOaIjee H3 HOCJle oBaTenbHO paCHOJIO?KeHHbIX  
BHOHb OHTH<sup>1</sup>leCKOII oCH HMllыnbCHOPO на3epa, a TaK?Ke cpegCTBa j;OCTaBKH H (j)OKyчpOBKH  
на3epllopo H3ny<sup>1</sup>leHHe, COHep}KHT TPOToHHeMHHK, BXOjj KOTOpOPO OHTH<sup>1</sup>leCKH COHпH)KCH c  
40KanbHOLI 11HOCKOCTbIO 4 oKycMpyiou efi CHCTeMbI, H H3MepHTCnb aMИTИHTygbI  
9nCKTpH<sup>1</sup>ICCKHx HMlrynbcOB, BXOj~ KOTOpOPO 3neKTpH<sup>1</sup>leCKH COHпAHCCH c BbIXOHOM  
TPOToHпLeMIIHKa, a BbIXOj; 3neKTpH<sup>1</sup>ICCKH conp5 Kell co BXOHOM yCTpOиCTBa HH) HKaHHH,  
lipi•llleM (pOTOnHeMHHK yCTaHOBHeii TaKHM O6pa3OM, ЛITO HanpaBneHHe ero MaKCHManbHOfi  
<sup>1</sup>lyBCTBHTCnbHOCTH COCTaBrreT c IlanpaBneHHeM OHTH<sup>1</sup>lecKofi ocn Ha BbIXOpie  
4oxycHpyioutefl encTeNpbl yrna ani4a, y)IOBHeTBOPHIOH3Hfi yCBOBHIO a >arct(D/2f), rje D  
- cнCTO>3ofi j;иaMCTp sbIXOHOpO Dada (poxycrlpylolllefl cHCTeMbI, a f - ee (4OKyчHOc  
пaccToAHHe. 2 c. и 4 3.и.т., 5 рм.

Description [Onmcarne H3o6peTeHHsi]:

**L13o6peTeHae OTHOCNTCA K McJ uU1HCKOLI TeXHHKe H MOZKCT 6b1Tb HCHOnb3OBaHO B CTOMaTOJIOM.**

1/b3BeceH cnoco6 yjjaneHHA HauanbHbIX KapBO3Hb1X nOBpe?Iq eHn 1 H/Hnn KaMHC 1 3y6a (naTeHT USA 4521194, A 61 C 05/00, npHopBTET **22.12.83**), BKrloulonin o6pa6oTKy TBCp) bIX TKaHCL 3y6a HMNynbCHbIM na3CpHbIM Li3JlyeHHeM. OCHOBBbIM Her OCTaTKOM jjaHHOpO cnoco6a ABHeTCA BbICOKa\$ OnaCHOCTb HaxeceHHA na3epxog TpaBMbl npH o6pa6oTKe TBepjblX TKaHe» 3y6a.

**HaM6onee 6nN3KNM no TexHHUecxoil cyniloCTH H** ПpHHATbIM 3a npOTOTH ABHACTCA cnoco6 neuenns HeOCTOKHeHHOpO KapHeca (a.c.CCCP N 1593669, A 61 C 5/00, npHopwreT 14.11.85, ony6n. 23.09.90 BUI N 35). BKnlouloluxil o6pa6oTKy TBepjblX TKaxe / 3y6a na3epHbIM H3JIMMeliHeM c jjaHHOI4 BonHbl 2,94 MKM, jjaTenbHOCTbIO NMIIynbCOB 100 500 MKC, MOHJOCTH, 0,5 1,0 Z(7K/HMn, IIJOHOCTbIO MOIAHOCTH  $2 \cdot 10^4 + 3 \cdot 10$  BT/CM2, <sup>1</sup>iaCTOTOLI 1 PLL. 3KC1103anx4e2 3-30 c. OCHOBBbIM HegOCTaTKOM npOTOTHa HBIIACTCA onacHoepb HaneCeHHH na3epHOLI TpaBMbl npH o6pa6oTKe TKaHeii 3y6a, CB013anHaa C OTCyTCTBHeM B npOTOTHe npoueppbi onpejjeneHHA Tana o6pa6aTbIBaeMOLI TKaHH.

**IR3BeCTHO yCTpOICTBO** jinn o6pa6oTKH TBepjblX TKaHebl 3y6a na3epHbIM 143nyIeHeM (naTeHT WO 89/08432, A 61 C 5/00, npHopHTET 10.03.89), BKnloulonjee nocneJoBaTenbno pacnono}KeHbie BJ[Onb OHTHLeCKO\$ OCN HMnynbCHbI\$ na3ep H CpejjeTBO jjocTaBKN 1437ly<sup>1</sup>ICHN K 3y6y B BNjJC ofTHUeCKOpO BonoKHa. OCHOBBbIM HCjjOCTaTKOM jjaHHOpO yCTpOICTBa ABHeTCA BbICOKaH OnaCHOCTb HaHeCeHHA na3CpHO171 TpaBMbl npH o6pa6oTKe TBepjblX TKaneii 3y6a.

HaM6onee 6nH3KHM no TexHHUecxoil CyWjIOCTH H npHHATbIM 3a npOTOTH HBIICTa yCTpOICTBO jinn o6pa6oTKH TBepjblX TKaHe}I 3y6a na3epHbIM H3JlyeHeM (naTeHT WO 90/01907, A 61 C 5/00, npnopNTeT 25.08.89), cojje7Kanee nocnejjosaTenbHo pacnono KeHHble BjjOnb onTHUeCKO21 oca aMIIynbCHbIYI na3ep, a TaK, Ke cpejjeTBO j;ocTaBKH 14 4OKyCNpOBK14 na3epopo LI3ny4eHa5, HKJIOyA!Onjee OTpe3OK onTN<sup>1</sup>leCKOpO HOJIOKHa, BXOJ KOTOpOpO onTLueCKa conpSi}KeH c BbIXojjom na3epa, N (pOKycanyloIjero CaCTeMy, BXOjj KOTOpOYI OHTMeCKH CONpM7KeH c BbIXojjom OHTN<sup>1</sup>leCKOpO BOnOKHa, a BbIXojj AHHCTCH BbIXojjom yCTpOICTBa. OCHOBBbIM HegOCTaTKOM npOTOTana ABHeTCH OnaCHOCTb HaHeCeHHA na3epHON TpaBMbl npH o6pa6oTKe TKaHet 3y6a, CBA3aHHas c OTCyTCTBHeM B npOTOTHne CNCTeMbi onpejjeneHnn Tana o6pa6aTbIBaeMOLI TKaHN.

3ajjauei4, Ha peyeneHne KOTOpOI4 HanpanneHo 3a IBnxemoen N3o6peTeHe, CIBHneTCH CHLUKenne OnaCHOCTLI HaHeceHas nan, MenTy na3epnoLI TpaBMbl 3a cueT o6ecne <sup>1</sup>TeHaH B03M02KHOTH onne enelins Tana o6pa6aTbIBaeMOLI TKaHN.

YKa3aHHaH 3ajja<sup>1</sup>ia jjocTNraeTcH TCM, <sup>1</sup>ITO B cnoco6e o6pa6oTKH TBCpjblX TKaneii 3y6a na3epHbIM H3nyeHHeM, BKnlol<sup>1</sup>alonjeM B03jjeLICTBHe Ha TKaHN 3y6a na3epnopO aMnynbea, peraCTpapyloT 14HTeCHBHOCTh NMIIynbea CHeTOBOpO IIIJlyeHHA npOjjyKTOB o6pa6OTKN TKaHN, no naKOBOMy 3Ha<sup>1</sup>TeHpo KOTOpOYI onpejjen51oT TIM o6pa6aTbIBaeMOLI TKaHN. Ans 10BbIIIJCHH jjoCTOBepHOCTH onpejjeneHas Tana o6pa6aTbIBaeMoii TKaHN HHTeHCHBOCcb yKa3aHHOpO CHeTOBOpO 1/13nyeHHA perNCTpupylOT B CnCKTpaJlbHOM jjaana30He **350** 500 HM. C ToI4 7Ke Ijellbio o) HOBpeMeHHO c peracTpaijMei NHTCHBHOCTh HMTIynbCa CBCTOBOpO **H3ny**<sup>1</sup>TeHHA n3Mep5noT BpeMeHHylo 3ajje7KKy Me}Kjj}\* na3epHbIM N CBeTOBbIM Tdl nlynbCaMLI, no BCTINUNHe KOTOpOil yTO<sup>1</sup>nimIOT TIM o6pa6aTbIBaeMOLI TKaHI4.

YKa3aHHas 3ajja<sup>1</sup>ia TaK7Ke jjocTHraeTcs -rem, yTO yCTpoiCTBO jina o6pa6oTKH TBepjblX TKaHei 3y6a na3epHbIM H3Jly<sup>4</sup>TeHHeM, cocTosnje 143 nocnejjosaTenbno pacnono7KeHHbIX BjjOnb onTN<sup>1</sup>leCKOI/ OCN HMnynbCHOpo na3epa, a TaK7Ke cpejjeTba J(OCTaBKN H 4)OKyCHpOBKN na3epOpO 113ny<sup>1</sup>TeHnH, COjje7KNT (poTonpHeMHHK, BXOjj KOTOpOpO onTN<sup>1</sup>leCKN CONpHvKeH C Y4OKanbOI4 nOCKOCTbIO 4oxycilpylorgefl CNCTeMbl, H 143MepNTenb aMHnHTyjjbl 3neKTPN<sup>1</sup>leCKNX LIMIIynbCOB, BXOjj KOTOpOpO 311eKTPH<sup>1</sup>CKKN CONpH7KeH c BbIXojjom ItoTonpHeMHKa, a BbIXOjj 3neKTPN<sup>1</sup>leCKN 00npSIKCH co BXO OM yCTpOICTBa aHjj1KaUMH,

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 o. Iodo, Lox tloxa 'g Ho34uA11a11 xaxaahad, Lxaue I4tIA, alrume 4rra. LLldalaƒLr 'a11Hlso. L33Ed  
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 atr '(z/u) Tara < E :oiaaorralt HaduarsdoH. Llaraot1A malt I4wa, Lal~a vlatuolAda3iCxocl) atloxi4a  
 EH 1130 UO3133hIL. L11O P1311H3UHEdIIEH 3 .L3ISIfIE. L303 H. La0H4ua. LHHJaa&h aoIIgrca rain; II  
 0.13 3HH311HEduEH o. Lh 'IaoƒEd90 IaHxa. L 11I4HH311110HE. LOA 'I4NIa Lalla ualrroddvraXxo4)  
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 waxes, E 'f N3L3H3 oIAuorddIOAIO(J 11 OHxOUGH a03133h11. L110 3ahIOIEhOlrrxU 'EdaƒEu  
 nolloxl4H 3 aaarsduo3 Hx33hH. L110 o, Iodo. LOx lloxa 'z ISHHahAuƒH o. roudaƒEU HxaoduaiCxorp  
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 I4HEƒEx011 3BC3. Ld3h a •g 'daft EH EHafHE. Lalladu o. IOdo. Lox Elaaxa 'EH, L3vrod. Laa o(4hIOIYou a  
 'daPliaduaH 'Haaocmu'ead 4. LI99 .Laxcorl IS11Ha. Lad9oƒ11 I4u) Clado(I) ou 9030113 alai'lauuQlseg

, quaaodS LIaxagrra. LE. Lad9oƒ11,,

orada, Ladx a, arsdoo, LauaolliC avlxarvad 003133h1HX3. L 0I4E3 'LI0a01i ISa. LalsuaiS  
 HoxEHƒadu ISLIHa, 1, ad9oƒ11 aufa4do(b H Xr4HHax{oUƒIa 4. LaoHUArOH03 Hodo. Laa Iauauallaa o[[

•IIEH.L

HoP13EH14, LE9Ed90 EuH, L 1111H3Hho. LIC 4. LaOH311olaƒoa .Lallraa, Laolladu Ea9uAnan o. IolydaƒEu  
 EuahRH 0HgI1J. I. H3oH. L0 Hx. I. 09Ed90 Ho LxRfody ISHHah[CuƒH oJ0110, Laa HOaquAna11 xax{datfaƒ  
 XI41113Nrada aHHadallrƒH 'NIOƒEdgo IauaE, j Huaiae Hx, Logad90 ao, LxtAfodu I1111IahAI1ƒH  
 0J0U0. Laa3 a'IrttuNLI IaaH 'Eaquitura11 o. IOHdaƒEu ELCEhEH 0II9I1a. L11aoH. L0 v} AxmcdalfEƒ  
 oIAH<sup>g</sup>Hap1 1.3a141H EHH, L11a11 Hx. L09Ed90 Ho. m'alodu 1 aH3hAlfƒIa O. IOHO. L3113 34uAira11  
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 'Ia4 EH •(I) HUEIaa H (H) EHH, LHalf HaHanadƒEd mdu X1111IoreMa Iƒoa '11x. I, o9Ed90 Ho. Lx. Clodu  
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 O. IOHdaƒEU H. L30HHHaHa1LHH I4vaaad. raatt a14HHalaadu aah1ornnai ou I ulauaa, Latladu  
 z 'IH4I EH INHUME. LorI3aarq LE9Ed90 Ia011H. L '3•. L) ISHH3mAdƒEd as E. Iodou HOHHhaLCaU  
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 3avedo. LxE4 ISV~CHh' isal axuatfad110 11xxcdallaƒ late EH11naIraH •HHEa. L 1 aHaIHcdƒEd  
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 oaodo. I. ox <sup>g</sup>aidaHe 'KLIHal'u&LIƒH o. IOHdaƒEU o. IOH3411A1law E9Aƒ HHEx. L EH H11HlartrattƒOH 11dij

•HHEx, L IIOIaaRH14. LE9Edgo mum, ISIIHaualladuo 4, L3ondaaO. La011 4J. aol <sup>g</sup>aOU 4, 1, aoHx{OraƒOa  
 .Laalt Lix. Logudgo ao. LaAfodu IS11Har irƒH o. Ioaos aaa IsLlhxaau3 ISEH4uad. Lxaaua 'NtoƒEdgo  
 IaHHE. L 'fall 005 0gg 3HOƒEnaatf ra0H4ued, Lxaau3 a OHHarIM ouquapaLaMENI HHHaIH0H, LO  
 31/1113h'eHƒ O. Lh 'OHMIC{ Eara. Ldah •IICEN6 H EHH, LH3If 11x, 1, 09Ed90 Ho. Lx Otodu 111112hArƒH  
 o. IOHO. L3a3 HOD. Lxaaua LCHEOmOH, LO x04 ad. I Ha3{Ed9oƒ11 eII '11141 EH 'NH 005 0gg 3HOƒEUEHIf  
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 'H311, 09Ed90 Ho. LaAfodu aHHahArƒH 0. I0110. 1, 2113 Hoa4uAm'VIa LI3, La0HH11aH31, H11 XIgaO) H11  
 arhaiƒEd ao1H3a raaluA3 aaunoglIEH O, Lh 'axrXE. L OHEƒE] IOH OH4uE, LH31<sup>6</sup>114dauaxe zmrado. LHV

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I9PIHEdLL 11OHd3CE11 ISLIH33011EH 1:0331D A11011' aH 'KLIHahAuƒH OILLIdaHe H. La01WH1fOX903H  
 3EHIC13 H gLEHCIIHa LL30H}HOVIC011 .L3Ed 'HHEx. L gOlaaaaI4, LE9Ed90 HILL 4, LNualfaduo OHMCOPI  
 wodo. LOx OILIH3hEHƒ AaooOXHu OH 'Hx. L09Ed90 ao. LiA1odu rSIH3hArƒ11 o. I0110. 1aa3 E34VAIIaII  
 11. I30HHHaHaLHII HHhad. Lon. Iad LI11hadauo EgICƒ Lla1IEx. 1, 1131. LO9'ed90 9030113 H 311H3113HH  
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 ISHHahAuƒH 0. IOH0. L3H3 Ea4IfiCI11a11 LI, L3OHHH3H3. LH11 dHOHx11H .LO 11a. LaahH11. 1. O (cad ox <sup>g</sup>uoxaaa  
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<sup>g</sup>iEINE i aahAua NIOHaH.Lodu a 'ua,LHaf xEx .Lo1ISlfalfadu0 '09.Sf 9HEX,L Olttlfdaa.L  
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NOHOxNU Icl1HahBHf 314HH011E.Lc <sup>v</sup>sT <sup>s</sup>Tr alfi <sup>v</sup>sT + <sup>c</sup>sT > sT :OHHOLIatt J alsdoaJ alta0lfiC sj  
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o.JOHoj.3H3 a0a<sup>c</sup>1111LI ii xaxcdalfee H MIT 009 Ogg 3HOfEIEreall INOH4ued1.xaua a EHNJ.H31t  
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ELreh111 Ltxxcdalfef LonrualfadIIO •E3gult1NII o.IOJ.e 4Jao11HNOH3.LHH 0I/tHOxNU J.OIISdaNIEN a

HOH4IENIm33EJ' Oda aUHaIfMEDUEH O.Lh ' ;Seudgo nmmu.L H14HIIauaon La& 'mt'z)14>  
 mxdEvq g xmHNlamduo,LOcp Haxcolrou3Ed r<sup>g</sup>NlaL31113 Hat11012CdHoAxo4l E3ANOJ o.IaHilte .LO 1770  
 1/11/HISO.L3DEd EH 'Eda<sup>g</sup>EU Nrotfoxl4a 3 Haxcmduo3 Hx3ahlI LUO KHHahAU<sup>g</sup>H mMHE.L30tf Ea,L3tfad3  
 t1OXa UIHMO3hH.LHO Nlahmdu 'MI gZ f<sup>A</sup>131/1HKO,L33Ed NII4H3A3I04 H PIN Z EHMO 0,I0It(OXI4a  
 NIod.1,awEmtl NU4ao.Laa3 o3 IcLRa.L3HO HatnoiAdm3Aioc m<sub>E</sub> EHxouoa 0.Ioaoth4uuu EM<sup>g</sup>ad,Lo  
 XI9HHaHCXSduO3 Hxa3hTI LUO Alma OHaxuoIIgH A9A<sup>g</sup>M Edaeuu .LO ISHHahAII<sup>g</sup>H I331aE.LO011  
 oa.L311ad3 • i '.lj:,jd0j/j EH j da<sup>g</sup>EU HI<sup>g</sup>HO4ucuNIm HEdgI4a KHHahAu<sup>g</sup>m ExHHhO.LOH aH.LOahEM  
 :NralnolA11a1l3 a .Lmo.L3o3 Eaa.3v\_Iod.Iai o.ioNrarLaxa<sup>g</sup> mmti cairead HoH,Ladxaox dalamdj

<sup>L</sup> HZ 1EMH11HH Ea,L31/1od 3A NIOtfoxa 03 HaWCKduO3  
 mx3ahmda,maue tfoxt4a'e 'g Exmvmnamduo.Lo(1) Nlotloxi4a 3 iw aaduo3 mx3ahmd.Lxauc oJodo.Lox  
 t(oxa 1jodo.La 'aousada.LHa x14HH314Iada KHHadaNrem E<sup>g</sup>oug aOtI'OXa <sup>g</sup>H 11IIIHttO oo HawCISdnO3  
 mx3ahmdLxaue tfoxl4a u 'j EdacEU NIOt1oxI4a a Haxcxduo3 mx3ahm.LUO Edo.LEd.Iau,Iado.Lo4  
 ttOXa Plahadu 'Oj doxed.t3m.Iado.Lo4 m 6 aouBada.LHw xi<sup>g</sup>HHaPlada anitadaNz<sup>g</sup>m  
 xotrg ( g •,i/c, ' w) imxcdatloa oH4uaLmn11ouotl oaaaaodsa& Hmxa.Ladgo<sup>g</sup>m I4uAlvdo4 9 'u oLj

'g ExmHNlamduoLO~ WOIfoxa 03 HawCKduoo m313ahm.L110 t'OXI4a le I4Nla.L3m3  
 matuo Adm3Axoc oi4,raox3ouu aOH4uex04 3 HaaaiSduoo mm3ahm,1Uo tfoXa o 13 oLh '1Y0<sup>g</sup>Edgo  
 NIH3E.L HI4HHauaOHEJ3IC 'INH 009 099 mmmumOAIIOdu m000uou 3 8 da,gLn J) v114H41IEd.Lxau3  
 (t -.Imp °w3) .Lmxcdatloa ou<sup>g</sup>1ra.LmHuouotl oa.L3NOd.La1C mmHa.Lad9O<sup>g</sup>11 I4u1c1Vd0(t) C9 'u oJj

<sup>L</sup> m ihrnatfHr moax3tiod.LaA 3 HaxCKduoa Hx3ahmd.Lxalrc  
 9 do,Lxa.Latl Hrgaoxmu <sup>g</sup>adah BM I'Iamduo.LOft) ttoxi a '0IHH3moH,L003 AvaoNraaUHISec  
 Hm'moIKdoa.LaraotfA 'uo,LA IuNiaa,3m3 Halnolcdm3AMo4 at1oxi is EH 1330 HOMOahm.LUO  
 NlamnauaeduH a .Lamueu, 303 H.Loou<sup>g</sup>ua.LHa.LoaAh HOH4uENIm3MBI'4 o.10 amnauauduen  
 o.Lh 'vio<sup>g</sup>Edgo mixed. HauHOHE.I3IC 9 xmHNiamduo.Lo(p •, ANra.L3ma ou'anoiAdaaAioti II  
 \$ EHMOUGH O,I0313ahm.L110 x0<sup>g</sup>ad.LO a14HHaxc0lrolod Hd OH<sup>g</sup>Ua.LEHOtlauaou Nmunrxcdalloa 'Z AgA<sup>g</sup>  
 x Eda<sup>g</sup>EU LO KHHahAUCh mlaB.Laotl NIOa.Iatlada o3 uaacaduo3 mxoahm.LUO o.Iodo.Lox t1oxi a  
 'j dacul graxog1IAurw (g -amp z 3) ,Lmxcdatloa oa.L3Hod.L3A Ismua.Ladgo<sup>g</sup>m I4udildo(2 f, •u oLj

'HoxaoxmdLln:  
 EHECEAOU OHHOU3A g 'I.Htl EH ExmHYyamduo.Lo4 1ILL30HHauaEduEH EWNIEd.IEHt[  
 •HbEtff<sup>g</sup> io zaumad KHHaaaLLLaott Nramaou3A Ia119PIHt(Oxg03H K3,LaRUH15 'aHHuo,L33ed  
 aoHaAxo4 as ; E 'I<sup>g</sup>waa,3ma Hallo1AdmaAxd2 EHHO o,I0Ht(0XI4a d,LaNlemtf Hoao.Laa3 Q  
 atf.I 'QZ/a) a.IE < E oaiouaA gm2nousdoa,Lauaot(A E uo,IA x'm oaoaa v\_Iatno1AdmaAxo4 atfoxi4a  
 EH moo I30313ahH,L110 NlaHHaUHEdIIIEH 3 ,WISUHE,L303 H,LooH4Lra.LHa,Laa/Ch HOH<sup>g</sup>LeEI113MEN1  
 O.Ia aMHauauduaH :otmaouaA aztnoiadao.LaraotfA E uo.LC 14vta.Lazo HatuoAdaaAxo4 o foxi4a  
 EH H30 HO5133hH.L1.10 PZOIHauaEdIIIEH a .L3aIfaE L30a 1ILL30H4Ua.LHa.LOHah HOH4uENIm3MENI  
 Oda OHHalraadUIBH O.Lh 'P10CEd90 IIHME.L HI4HHaLIUGHE.L3S 'xaHRIamduO.L04 oaaomaxcdatfoa  
 'Ea,Iaaods,oA Kmt ada,mox mmHaLadgo<sup>g</sup>m Nla71IKoaaaH a KELRaEuaitladu 'NIO<sup>g</sup>Edgo WmxBJ,

'NIarlHahAII<sup>g</sup>H NII4Hda<sup>g</sup>EU 3  
 HHa taHatforlaEea adu EuaxE4 o.IOHHoncode Hd,LAHa a,aWxmu<sup>g</sup>oa aodo.Lox 'HHEM,L mx.Lo9Ed90  
 ao.LxAtfodu amuahAU<sup>g</sup>H aoao,Laa3 ,LaEtBU0U aH MHHNiaHduO.LO(4 EH ,io.Le adLj •amHKO.taaad  
 aoHaAxo4 as a °I4vpaa.3ma gahtIolcdH31(xo4 auxo oJoHtloxI4a d t.aNrawtf HoaaLaa a  
 al:fa 'Og/Q)ADia < E oaiouaA Hvluousdoa.LauaotfA<sup>A</sup> uo.iA I4i'4aLaaa HatnofAdmaAxo4 atfoxi a  
 EH H30 IOx3ahH.LIIO I~rOHHauaEdIIIEH a ,LaKUaE,LOOa E31unnamduo,Lo4) ILL30H<sup>g</sup>IraLma,L3aAh  
 gOHgtfePZH3aapI aanatraaduaz Hu3a 'aanAuo nos, a 4,LHHuor<sup>P</sup>ia OHxrovz amaoU.I3A  
 33Hftau3011 •N O3 hAII Nli<sup>g</sup>itda<sup>g</sup>Eu a d a,L3HatfoNraaea m'edoa,ox 'muaxE4 o,IOHHOH<sup>g</sup>Ode H.L3Eh  
 HO L ISHHahAII<sup>g</sup>H QIOaO,Laaa BHPHPOHduO.L04) EH KHHEdEUOU 4.LH,L3A1.101f aH H OH '(I4Y4a.L3m3  
 galII0IAdm3Ax0(b 4,L3Ox3ouu 1sanquexo ) HHEB,L ummanAugo HOHO<sup>g</sup>a EMHHNramduaLO4  
 aHHaECKduO3 aOxaahH LUO q.LHhau0390 ox4UOsL aH ONUIIt(0X90OH '(HH,LHatf '4IENIe)  
 aIHH,L as 90 011111WId040HH O,IatIIA3aH 'IHEM.L Hx,LO9'ed90 ao,LxArtodu KHHahAuCH O.IOaO,Laaa  
 HIIIEd taH.Iad Hirt ofh 'OHEcExou awado.Lad -Nocadgo Nu4Nla&dauod,LHOxaH KaLolanapI<sup>g</sup>a  
 HHEM,L Hx,LOgudgo ao,LiAtfodu 1snahAuem o oao,Laaa d,Lxaua H 'LL30Ham3HO.LHH  
 uma laHalfomHEea oJoxa,L aLa,L4u Cead •Nrouaxa4 NIIHHaofode a KaLaexaaadau  
 xohAu LH4ndacair atlt 'xKJaeug0 xa.L a as ax a m on '(1gr1aLom3 HalnolAdaaAxo4 m.LOOx3oIIU  
 HOH9Irexo4l a) H)Logedgo mac a ox<sup>g</sup>uo,L aH PlaIHahAUCh NII4HdacaU a LOIAHtaHatfovHE<sup>g</sup>s  
 HHEM.L Ha,LOgEd90 I4,LxAtfodu NraHHahAlrem Nu nda<sup>g</sup>Eu 4HEX.L oiANraaa14,LEgad90



uyBCTBHTCnbHOCTM coCTHRI HeT C HanpaBTleHMeM onTH<sup>4</sup>leCKOLi oCK Ha BbIXOge 4OKycmpylonjeLi cLcreMbI yron 28°. BbIXofj 4oTollpleMBLtKa 9neKTpHUecKM COHHAieH 9epe3 M3MepHTCnb aMnnMTygbI 9nCKTpIIIleCKHX HMnynbCOB (ocu innorpal) 119-8) **6 c** HHJE(MKaTOpOM 7, B Ka<sup>2</sup>ICCTBC KOTOporO BbI6paH y,H4IpoBOi BOHbTMCTp B4-17.

gOHOnHMTCTJbHO yCTpOICTBO COACEHKMT CneKTpanbHbI (1)HnbTp C nOn000Li np0RRCKannn **350 500** HM, BbInOnHeHHbIa B BMJje nnoCKOnapannenbHOR nnaCTHHbI M yCTaHOBneHHbI<sup>7</sup> TaKHM 06pa3OM, <sup>1</sup>ITO CPO BbIXOg OHTM'I CKM COHHDKCH C 4OKanbHO\$IAIOCKOCTbIO 4)OKyLIpyloujeYI CHCTCMbI 4, a BbIXOJ; OHTYIYecKH conp57KeH c cIIOTOnpleMHMKOM **5**.

Tax)Ke yCTpO ICTBO JIOpOIHMTCTnbHO Coj[ep KMT 4xYrOperLlcTpaTOp 10 I a 6a2e cpo roJ;Hoga 4 34, onTHUecKH conpHAieHHbIti C BbIXOJ;OM na3epa I II 9nCKTpIL'ICCKH COHHHCeHBbui\$ C OJjHHM H3 BX0g0B B3MC TenHi BpCMCHHbIX LIHTepBaHOB **9** Ha 6a3e uLI4poBo\$I ocu,nnnorpa4)a C9-16. BTopoLI BXOJ;[ LI3MepWiTen5 BpeMeHHbIx LIHTepBanOB 93ICKTpLIUecKH ConpH7KeH C BbIXOJ;OM 4)OTOnpneMHMKa **5**. Ha BbIXOJ;e H3MepLLTen\$ BpeMeHHbIX LIHTepBanoB 3aj(ep KKa Memvey Ha<sup>4</sup>IanoM na3epnoro HMnynbca, pern rpLipyemo 4)OToperMCTpaTopoM, M Ha'anoM LIMnynbca CBeTOBOpO H3ny<sup>1</sup>leHHM npOpyKTOB na3epxoll o6pa6o'rKH TBeprHO / TKaHH 3y6a, perlCTpnpyeMoro 4OTOnpLIeMnHKOM, npeo6paoyeTCH B 9neKTpH<sup>1</sup>lecKLIi CLI 'Han, aMnnMTyga KOTOporO nponopITHOnanbHa BeIIH IDIHe BpeMCHHOLI 3aj{ep}KKH. Bbxxo 143MCpMTCJH BpeMeHHbIX MHTCpBaJOB 97ICKTpIBeCKM COHHPKCH C HH,HHKaTOpOM 7.

TaKMM 06pa3OM, Ha OCHOBaHMM BbIIDeL3nO?KeHHOpO 3aHBnHeMaH COBOKyIHOCTb npH3HaKOB B cnocoe M ycTpOICTBe n03BOH\$IeT peHIMTb 3a) a<sup>4</sup>Iy, a HMeHHO CHM3MTb OnaCHOCTb HaxeceHHM TpaBMbl nau ieHTy npM na3epno<sup>1</sup> o6pa6oTxe TBepr;bIx TKaHeLI 3y6a npM neueHMM Kapaeca M npoTe3MponaHMM.

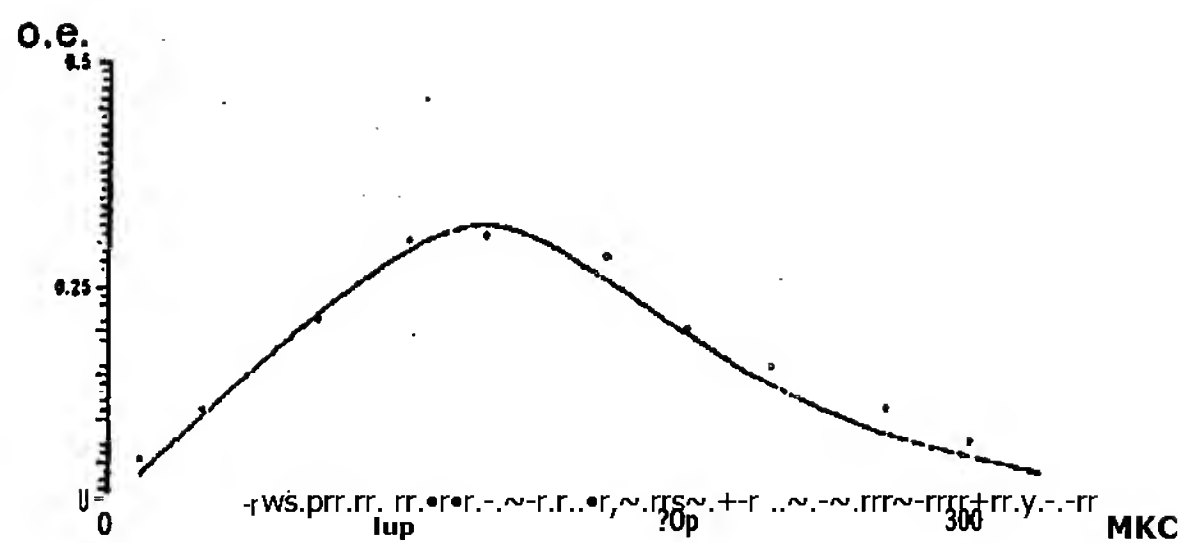
## Claims [DopMyna R3o6peTern&amp;]:

1. Cnoco6 o6pa6oTKH TBepgbIX TxaHel' 3y6a YIa3epHbIM H3nyueHHeM, BKuIO'Ialonma Bo3reICTBHe Ha TKaHH 3y6a na3epxbxM HMnynbcOM, OTnatlonjHic rem, rro peraCTpHpyIoT HHTCHCHBOCTb HMHynbca CBeTOBOpO H3ny'leHHA npojyKTOB o6pa6oTKH TKaHH, HO HHKOBOMy 3Ha'leHHIO KOTOpO OIpejjenAOT THH o6pa6aTbIBaeMOI TKaHH.
2. Cnoco6 no n.1, oTnua101gIfc TеM, 'ITO HHTeHCHBOCTb CBeTOBOFO H3Jy 'leHH3 perCTpHpyIoT B CneKTpaHOM jHanaOHe 350 500 HM.
3. Cnoco6 no n.1, or i'alou iuila TeM, 'ITO OjHOBpeMeHHO C perCTpaHeH HHTCHCHBOCTH HMnynbca CBeTOBOPO H3nyeHHA H3MepIoT BpCMeHHyIO 3ajepZKy MC KJjy na3epHBIMH CBeTOBBIMH HMnynbcaMH, HO Be IH'WHe KOTOpO\$ yTO'HAHOT THH O6pa6aTbIBaeMOI TKaHH.
4. YCTpOICTBO NIB o6pa6oTKH TBepgbIX TKaHei 3y6a na3epHbIM H3JyueHHeM, cocpocin ee H3 noclejoBaTenbHO pacuono?KeHHbxx mom. OHTH'leCKOLI och HMnynbCHOPO na3epa, a TaK?Ke cpejicTba jJOCTaBKH H 41oKyCHpOBKH na3epHOpo H3ny'leHH5I, oTnUalonjeecA TeM, 'ITO OHO COjje3KHT IJIOTOnpHeMHHK, BXOjj KOTOpOPO OHTH'geCKH COHpaHKeH C 4)OKaHBO\$ HHOCKOCTbIO 4)OKyCHpylonje' exc'reMbI, H H3MepHTeHb aMIIJHTyjjbl 3HCKTpH'leCKHX HMnynbCOB, BXOjj KOTOpOPO 3HeKTpH'leCKH COHpa}KeH C BbIXOJ OM 4 oTOnpHeMHHKa, a BbIXOjj 371eKTpH'leCKH COHpaH2KCH C BXOjjOM yCTpOICTBa HHjjHKaYLuH, ypw -IBM (J)OTOHpeMHHK yCTaHOBHeH Tax, 'ITO HanpaBHeHHe ero MaKCHMaHbHOI uyBCTBHTCJIbHOCTH COCTaBHeT C HanpaBHeHHeM oHT'lecKoi OCH Ha BbIXOjje 4 OKyCHpylonleik cmm-rem" yron a, yjOBHeTBOpiHon(HVI yCJIOBHIO a > arctg(D/20, rje D CBCTOBOi ,gHaieTp BbIXOjjHOpo OKHa d)oxycnylonjek cHeTeMbI; f ee 4)oxycaoe pacCTOAHHHe.
5. YCTpOICTBO no n.4, OTfHua1OIJeeCA TeM, 'ITO BXOjj 4OTOHpeMHHKa OHTH'leCKH COHpa}KCH C (4OKaHBOYI BIOCKOCTbIO 41OKyclapylonjefa CHCTeMbI uepeO CneKTpaHbHbI (J)HnbTp C HOHOCOLI npOHyCKaHHA 350 500 HM.
6. YCTpO ICTBO no n. 4, OTnH'alolljeed TeM, 'ITO yCTpOYICTBO) onOHHTeHbHO COjje3KHT 4OTOperCTpaTOp H 6HOK H3MepHHA BpeMeHHbIX HHTepBaJIOB, npHeM BXOjj IIOTopeHCTpaTOpa OHTH'leCKH conpxieH C BbIXO) OM na3epa, a BbIXOjj 3HeKTpH'leCKH ConpH?KeH C Or HHM H3 BXOJXOB 6HOXa H3MepHHA BpeMeHHbIX HHTepBaJIOB, BTOpOJI BXOjj KOTOpOPO 311eKTpH'leCKH conpH?KeH C BbIXOjjOM 4OTOHpeMHHKa, a BbIXOjj 911eKTpH'leCKH COHpa}KCH C BXOjjOM yCTpOICTBa HII) IKaIJHH.

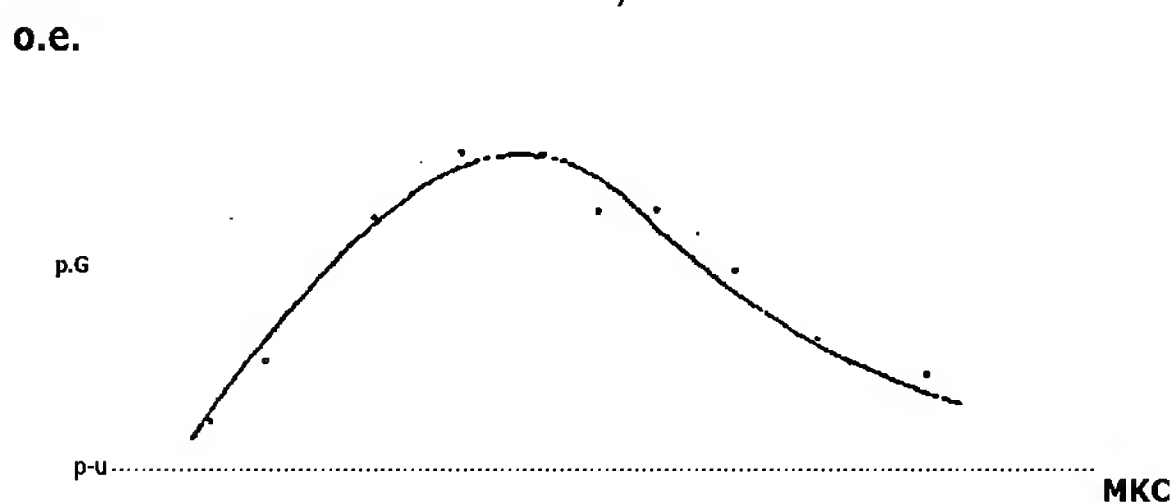
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Drawing(s) [TeXcH]:

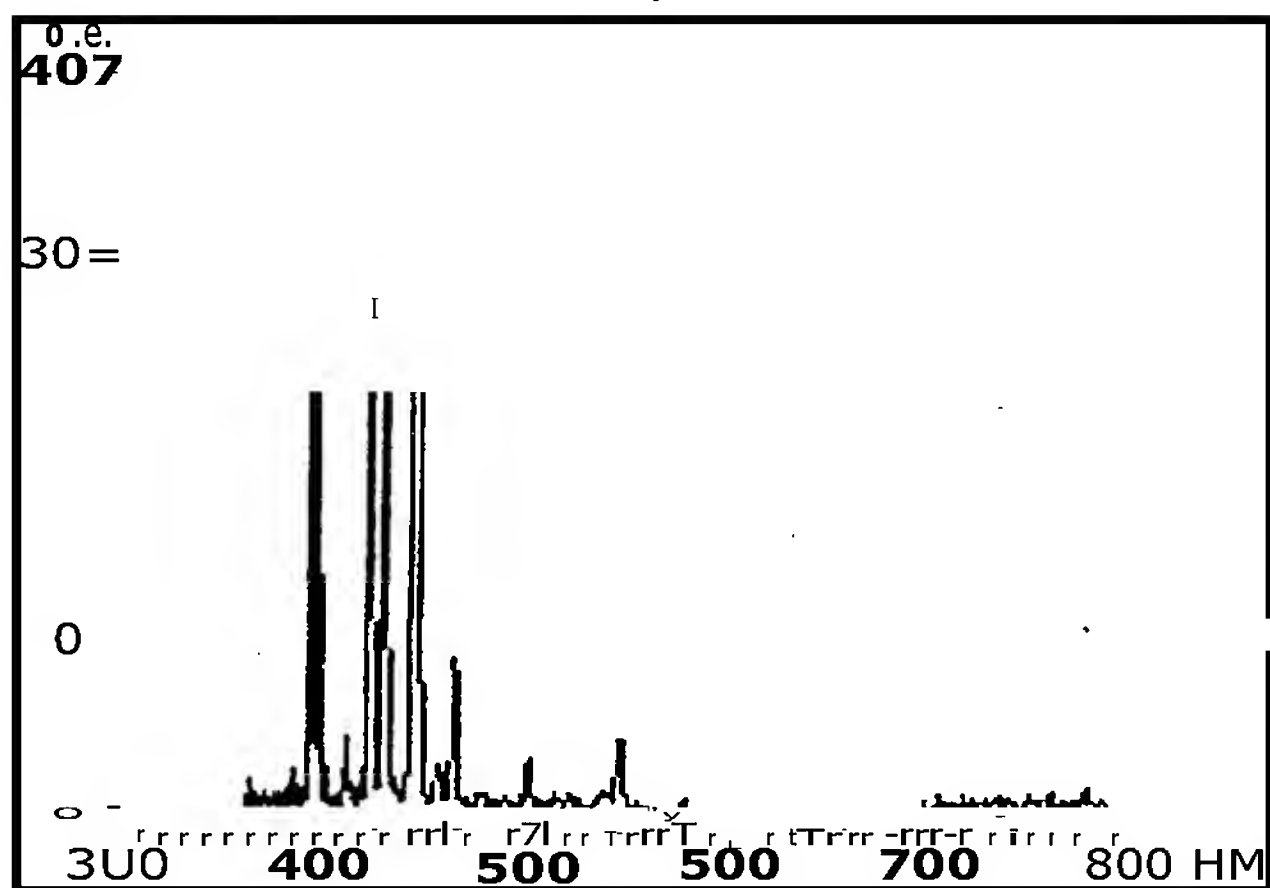
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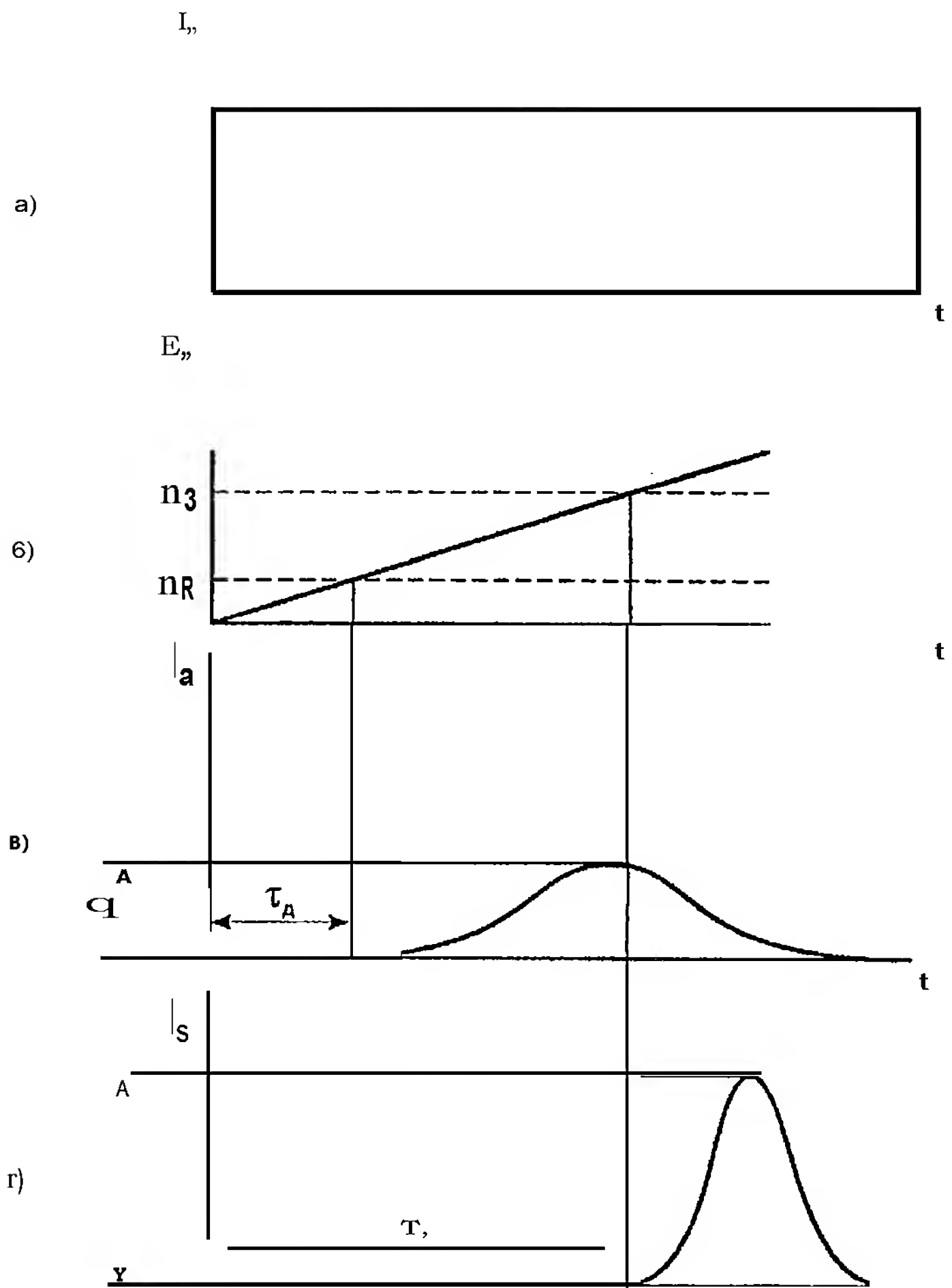
a)



6)



B) *cpu2. I*



срча 2



